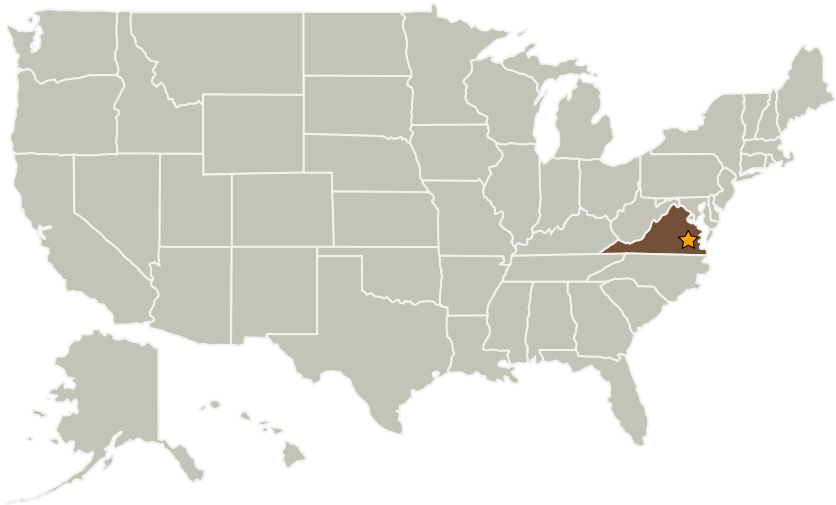
A Highly Integrated Multi-Parameter Distributed Fiber-Optic Instrumentation System, Phase II

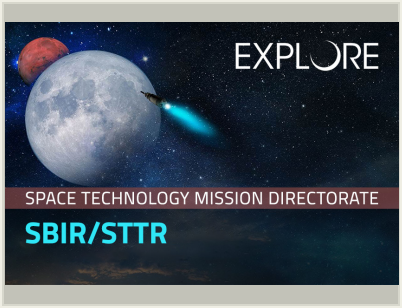
Completed Technology Project (2007 - 2009)

Project Introduction

In the future, exploration missions will benefit greatly from advanced metrology capabilities, particularly structural health monitoring systems that provide real time in-situ diagnostics and evaluation of structural integrity. Safety- and mission-critical components and systems will be instrumented with embedded sensors to provide a real-time indication of health, helping to ensure that America's space exploration remains safe and cost efficient. One of the most promising technologies for accomplishing this is fiber-optic sensors. Due to their light-weight and multiplexing potential, fiber-optic sensors are highly desirable for employment in this fashion. However, most commercial fiber-optic sensor interrogators are bench sized units and are too large and heavy to be easily integrated for space-based applications. To address this shortcoming, Luna Innovations proposes to develop a compact, light-weight, multi-parameter distributed fiber-optic instrumentation system based on the OFDR technique. The interrogator will incorporate photonic integrated circuit technology, a highly integrated swept-wavelength laser, and state-of-the-art integrated processing technology to dramatically reduce the size, weight, and cost and to dramatically increase the performance and robustness relative to existing technology. This interrogator will interface with fiber-optic strain, temperature, and shape sensor arrays, enabling simultaneous interrogation of a multitude of sensors, dramatically reducing the per sensor cost of instrumentation.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Luna Innovations, Inc.	Supporting Organization	Industry	Roanoke, Virginia

Primary U.S. Work Locations
Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.6 Instrumentation and Health Monitoring for EDL